

Abstract Submitted
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The effect of polymer architecture on the interdiffusion in thin polymer films. AYSE CAGLAYAN, Bogazici Uni, GUANGCUI YUAN, SUSHIL K. SATIJA, NIST, DAVID UHRIG, KUNLUN HONG, ORNL, BULENT AKGUN, Bogazici Uni — Branched polymer chains have been traditionally used in industrial applications as additives. Recently they have found applications in electrochromic displays, lithography, biomedical coatings and targeting multidrug resistant bacteria. In some of these applications where they are confined in thin layers, it is important to understand the relation between the mobility and polymer chain architecture to optimize the processing conditions. Earlier interdiffusion measurements on linear and cyclic polymer chains demonstrated the key role of chain architecture on mobility. We have determined the vertical diffusion coefficients of the star polystyrene chains in thin films as a function of number of polymer arms, molecular weight per arm, and film thickness using neutron reflectivity (NR) and compare our results with linear chains of identical total molecular weight. Bilayer samples of 4-arm and 8-arm protonated polystyrenes (hPS) and deuterated polystyrenes (dPS) were used to elucidate the effect of polymer chain architecture on polymer diffusion. NR measurements indicate that the mobility of polymer chains in thin films get faster as the number of polymer arms increases and the arm molecular weight decreases. Both star polymers showed faster interdiffusion compared to their linear analog. Diffusion coefficient of branched PS chains has a weak dependence on the film thickness.

Ayşe Caglayan
Bogazici Uni

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